DEPARTMENT OF AGRICULTURE.

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MICROSCOPIC OBSERVATIONS.

BY

THOMAS TAYLOR, M. D.

INTERNAL PARASITES IN DOMESTIC FOWLS,

AND

BUTTER AND FATS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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MICROSCOPIC OBSERVATIONS.

INTERNAL PARASITES IN DOMESTIC FOWLS.

During the past year I examined several sick domestic fowls to ascertain the cause of their ailment. The first examined was in a moribund condition when received, and died within an hour after it was brought to my notice. Its comb was of a deep red color—abnormally so, the tips being somewhat black. On dissection, its general viscera presented nothing peculiar, but on removing those of the thorax and abdomen, the lungs excepted, I observed on the intercostal muscles bordering on the ribs what resembled a superficial reddish pigment, in streaks, while small specks of various forms covered the lining of the abdominal cavity. These varied in size from the point of a pin to that of a small pinhead. On removing a small portion of this colored matter, and viewing it under a suitable power of the microscope, I found it to consist of living mites (*Acari*) in various stages of growth. I next removed a small portion of the lung tissue, and placing it under the microscope, here again discovered several living mites. Another portion was removed from the lungs, not exceeding half a grain in weight, when three more mites were discovered. These last were so lively that it was difficult to keep them long in view without changing the stage.

This mite closely resembles *Cytoleichus sarcoptoides* (Mègnin). Although this species has not hitherto been found in America, it is known in Europe, and has been found in such habitats as above described; and Mègnin states that it causes the death of wild and domestic fowls. He says that they are found in the air passages of the lungs, in the bronchial tubes and their divisions, in the bones with which the air sacs communicate, and in other cavities. They are also found in the bronchi of birds, and, when they are extremely numerous, cause titillations of the bronchial mucous membrane, indicated by a slight cough, in some cases causing symptoms of asphyxia and of congestion, to which the birds may succumb. He instances an example in the case of a pheasant which died of an unknown disease, and in which, when dissected, this obstruction of the bronchi was well manifested.

I think it probable that these mites, after they have effected a lodgment in the lungs, bore through the pleura and invade the thoracic and abdominal cavities, where they breed in large numbers, producing great irritation, and ultimately the death of the fowl.

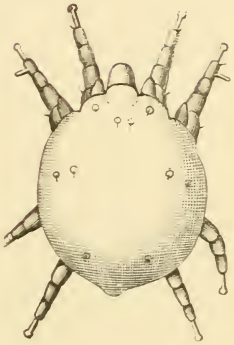
About two months after the dissection of the first fowl in which I found the mites already described, a second fowl in a moribund condition was brought to me for examination by the same gentleman who brought the first. The comb of this fowl was also highly engorged with blood, and the tips black. Its crop was greatly distended. It was unable to stand up, breathed with difficulty, yet exhibited considerable strength when about to be killed. It had been sickly during the previous four weeks. I took the precaution in this case to remove the skin so that I could examine the cellular tissue when I observed great numbers of small, white, opaque specks, of various dimensions, varying in size from the one-hundredth of an inch to the one-twelfth of an inch in diameter. When viewed under the microscope, the tissue showed within its folds and cell structure numerous mites, which proved on examination to be *Laminosioptes gallinorum* (Mègnin). Further investigation showed that the opaque markings above alluded to contained, in many instances, the remains of one or more of these mites. The substance of the opaque specks was calcareous. The habitat of these mites seemed to be confined to the cellular tissue wholly. I examined the viscera and cavities of this fowl, but found neither living mites nor their remains, or calcareous specks.

Mègnin states that in Europe this acarus has been found in all turkey hens, and especially in foreign turkeys of the family *Phasania.* He says that these acari gather in millions in the cellular tissue and destroy the fibers, but without causing any other change than the production of the calcareous concretions spoken of. He further says: "They have been noticed in such numbers in old birds as to leave no doubt as to their being the cause of death." The existence of either of the mites above described, in American fowls, has not hitherto been known.

In this same fowl I found thousands of encysted nematoids, resembling, when viewed under a low power of the microscope, *trichina spiralis;* but when removed from their watery cysts and viewed under a power of about × 500 diameters, they seemed to be of an undescribed species. The male worm has on its posterior terminal point a bulbous body furnished with spines which distinguish it from any other nematoid with which I am acquainted. These encysted worms are wholly confined to the muscular coating of the stomach and intestines.

On examining a third fowl, which was dead when brought to me, I found in its cellular tissue numerous mites of the species *gallinorum,* above described.

From the results of these examinations, it seems probable that a considerable amount of disease prevailing among American domestic



Cytoleichus sarcoptoides.

Laminosioptes gallinorum.

fowls, and not referable to any known type, may be due to the presence of such parasites as I found in the cases above mentioned. Investigations in this direction may therefore have an important bearing on the healthful raising of domestic fowls.

I would suggest that carbolic acid, or other disinfectants, sprinkled in and about nests and on the floors of henneries, might prove useful as an antidote to parasites of the classes described, as well as to those which infest the exterior of the bodies of fowls.

BUTTER AND FATS.

Since the invention of artificial butter a vast trade has sprung up in its production. In the manufacture of imitation butter, beef, swine, and vegetable fats are used, and although many inferior samples have from time to time been detected in the markets of the United States, oleomargarines of a very superior quality are now manufactured, and so nearly do they resemble true butter, in appearance and taste, that persons skilled in dairy butter are frequently deceived by them. Oleomargarine is therefore very frequently sold as butter, unknowingly to the retailer as well as to the buyer.

For several years past, samples of true butter and oleomargarine have been frequently sent to the Microscopical Division for examination, in order that their true character might be determined. In the early stages of the manufacture of oleomargarine, it was comparatively an easy task to decide. The samples then sent were generally very impure, containing as they frequently did, portions of animal tissue, blood vessels, and other impurities, which were easily detected by the microscope. The manufacturers, however, soon devised means by which these impurities were removed, during certain stages of its manufacture.

In the early stages of investigation by the microscope, it was considered that by the use of the high powers, butter might be at once distinguished from oleomargarine by a comparison of the oil globules of each; but it was found that this was a very unsatisfactory and unreliable method. Aware of the fact that all the artificial butter was made directly from crystallized fats, I devised a method by which it could be distinguished from true butter, on the principle that the fats are polarizing bodies, and that by subjecting samples to the action of polarized light, the prismatic colors would be exhibited. Butter being destitute of free fats, the colors of polarized light would not appear.

To carry out this plan, I used the low powers of the microscope, with Nicol's prisms. In this way, I found that I had a method of detecting the crystals of fat, whether in perfect starry forms or as fragments of these forms, exhibiting all the colors of the rainbow. In process of time, however, the manufacturers of oleomargarine made further improvements, and so free from crystals of fat were the samples of oleomargarine sent in, that the polarizing method described failed to distinguish them from butter. To overcome this, I next introduced a selenite plate under the samples to be examined and between the Nicol's prisms. The object of this was to detect fatty bodies in a homogeneous

BUTTER & FATS.

MICROSCOPIC OBSERVATIONS BY DR. THOMAS TAYLOR. PLATE 1.

Butter and Oleomargarine as seen under Polarized light and Selenite plate.

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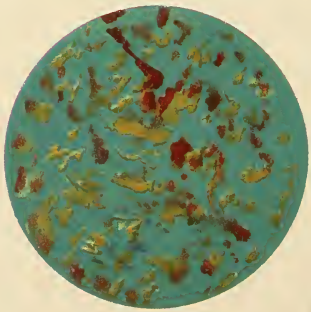
4.

5.



6.

A. Hoen & Co. Lith. Baltimore.

state. On experiment, the result proved wholly satisfactory. Although not so much as a single crystalline form may be present, all the prismatic colors are reflected in the most vivid manner throughout the homogeneous mass, while pure butter will exhibit, under the same conditions, plain red or green, depending on the properties of the selenite plate used. This will be understood at once by those skilled in the use of the microscope.

The descriptive plate annexed will show the practical results obtained by these methods.

Plate I, Fig. 1. Represents pure butter as seen with aid of polarized light, using a selenite plate, which may, at the will of the operator, exhibit a green or red color.

Plate I, Fig. 2. Represents boiled butter, under polarized light with green selenite plate.

Plate I, Fig. 3. Represents crystallized lard under similar conditions.

Plate I, Fig. 4. Represents crystallized lard in homogeneous condition.

Plate I, Fig. 5. Represents crystallized beef fat.

Plate I, Fig. 6. Represents crystallized beef fat in homogeneous condition.

The forms exhibited will always vary more or less, but the diagram represents their general appearance when viewed in the manner described.

Notwithstanding the value of these microscopic tests in distinguishing the various oleomargarines from butter, it is evident that they can only be made by those who are accustomed to the use of the microscope. With the view of obtaining a simple method more attainable by the general public, I made a series of experiments with oleomargarine, of different fats, using a variety of acids to ascertain what permanent change of color would take place by oxidation, &c. Of the various acids employed, sulphuric acid gave the most satisfactory results. The test is a very simple one. If a few drops of sulphuric acid be combined with a small quantity of pure butter, the butter will assume first an opaque whitish yellow color, and, after the lapse of about ten minutes, it will change to a brick red. Oleomargarine made of beef fat, when treated in the same manner, changes at first to clear amber, and after the lapse of about twenty minutes, to a deep crimson.

That the changes in color do not arise from the action of the sulphuric acid on the artificial coloring matter (annotto) is certain, as I find that when annotto is combined with sulphuric acid, a dark bluish-green color is produced, entirely unlike any of the changes mentioned.

Owing to the active corrosive properties of the sulphuric acid, in making these tests, a glass rod should be used in combining these substances.